Assessment of Air Quality in the Shuttle and International Space Station (ISS)
Based on Samples Returned by STS-104 at the Conclusion of 7A

The toxicological assessment of air samples returned at the end of the STS-104 (7A) flight to the ISS is reported. ISS air samples were taken in June and July 2001 from the Service Module, FGB, and U.S. Laboratory using grab sample canisters (GSCs) and/or formaldehyde badges. Preflight and end-of-mission samples were obtained from *Atlantis* using GSCs. Solid sorbent air sampler (SSAS) samples were obtained from the ISS in April, June, and July. Analytical methods have not changed from earlier reports, and all quality control measures were met.

The two general criteria used to assess air quality are the total-non-methane-volatile organic hydrocarbons (NMVOCs) and the total T-value (minus the CO_2 and formaldehyde contribution). Because of the Freon 218 (octafluoropropane, OFP) leak, its contribution to the NMVOC is indicated in brackets. When comparing the NMVOC values with the 25 mg/m^3 guideline, the OFP contributions should be subtracted. Control of atmospheric alcohols is important to the water recovery system engineers, hence total alcohols were also assessed in each sample. Formaldehyde (methanal) is quantified separately. These five indices are summarized below:

Sample Location	Date/Type	NMVOCs (mg/m^3)	[OFP] (mg/m^3)	T Value[a] (units)	Alcohols (mg/m^3)	Methanal (mg/m^3)
Lab-SSAS	4/09/01	28	[22]	0.50	1.6	0.024
SM-SSAS	4/09/01	38	[34]	0.31	0.7	0.019
Lab-SSAS	6/13/01	36	[27]	0.66	4.3	0.038
Lab-GSC	6/13/01	42	[34]	0.56	2.8	0.038
FGB-GSC	6/13/01	47	[40]	0.81	3.1	ns[b]
SM-SSAS	6/13/01	86	[77]	0.76	2.6	0.031
SM-GSC	6/13/01	46	[38]	0.61	3.0	0.031
Lab-SSAS	7/9/01	46	[38]	0.54	3.9	0.038
Lab-GSC	7/9/01	43	[38]	0.33	2.3	0.038
FGB-GSC	7/9/01	62	[55]	0.52	2.4	ns
SM-GSC	7/9/01	71	[67]	0.59	1.9	0.026
Shuttle middeck-GSC	7/12/01(preflt)	0.2	[0]	0.02	0.1	ns
Shuttle middeck-GSC	7/23/01(EOM)[b]	48	[40]	0.47	3.8	ns
Acceptable Guideline>>>		<25	[85000]	<1	<10	0.050

[a] Formaldehyde (methanal) and CO2 not included in T calculation.
[b] ns = not sampled and EOM = end of mission sample

Taken as a whole, these data suggest that air pollutants were controlled to acceptable levels to protect crew health. The increase in the average OFP concentration between the June and July GSC samples, and the higher quantity in the July SM GSC sample suggest that OFP was leaking from an ISS system in the SM faster than it was being scrubbed from the air. The concentration of OFP was far below any that would cause a health concern. To the extent that the samples were representative of each respective vehicle atmosphere, there was no evidence that *Atlantis* contributed significantly to the alcohol load in the ISS atmosphere.

Enclosures
1A: Analytical Results of 7A and STS-104 GSC Air Samples
1B: Analytical results of 7A SSAS tubes
2A: T Values of 7A and STS-104 Air Samples
2B: T Values of 7A SSAS tubes